

Exhibit F

INVALIDITY CONTENTIONS FOR U.S. PATENT NO. 7,177,369
BASED ON “MULTIUSER OFDM WITH ADAPTIVE SUBCARRIER, BIT AND POWER ALLOCATION,” (“WONG”)

Based upon Plaintiff’s Complaint, Infringement Contentions, and apparent claim constructions and application of the claims to Defendant’s accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission by the Defendant that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that the Defendant concedes or acquiesces to any claim construction implied or suggested by Plaintiff’s Complaint or Infringement Contentions. Nor is Defendant asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

Wong et al., “Multiuser OFDM with Adaptive Subcarrier, Bit and Power Allocation,” IEEE J. Select. Areas Commun., Vol. 17(10), pp. 1747-1758, October 1999. Wong is prior art under at least 35 U.S.C. § 102(a)(b), and 103(a). As described in the following claim chart, the asserted claims of U.S. Patent No. 7,177,369 (the “’369 Patent”), are invalid as anticipated by Wong.

To the extent that Wong is found not to anticipate one or more of the asserted claims of the ’369 Patent, these claims are invalid as obvious in view of Wong alone or in combination with other prior art references disclosed in Defendant’s Invalidity Contentions and accompanying charts, including without limitation as set forth below.

Wong is referenced in Li 748 which is incorporated by reference into Li 827.

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Claim 1	
1[p] A method comprising:	<p>To the extent the preamble is limiting, Wong discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p>

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	<p>Wong teaches a system that uses the channel estimation to modify the transmission power levels for OFDM tones.</p> <p>Wong at 1747 (“Assuming knowledge of the instantaneous channel gains for all users, we propose a multiuser OFDM subcarrier, bit, and power allocation algorithm to minimize the total transmit power. This is done by assigning each user a set of subcarriers and by determining the number of bits and the transmit power level for each subcarrier. “);</p> <p>Wong at 1747 (“Assuming that the transmitter knows the instantaneous channel transfer functions of all users, many papers [5]–[7] have demonstrated that significant performance improvement can be achieved if adaptive modulation is used with OFDM. In particular, subcarriers with large channel gains employ higher order modulation to carry more bits/OFDM symbol, while subcarriers in deep fade carry one or even zero bits/symbol. Integrated design of forward error correcting code and adaptive modulation has also been studied using BCH code and trellis coded modulation (TCM) in [8] and [9], respectively. Although both references considered only time-varying flat fading channels, the same coded adaptive modulation design can be easily applied to OFDM systems. As different subcarriers experience different fades and transmit different numbers of bits, the transmit power levels must be changed accordingly. The problem of optimal power allocation has also been studied in [10].</p> <p>In this paper, we consider extending OFDM with adaptive modulation to multiuser frequency selective fading environments. When OFDM with adaptive modulation is applied in a frequency selective fading channel, a significant portion of the subcarriers may not be used. These are typically subcarriers which experience deep fade and are not power efficient to carry any information bit. In multiuser systems using static time-division multiple access (TDMA) or frequency-division multiple access (FDMA) as multiaccess schemes, each user is allocated a predetermined time slot or frequency band to apply OFDM with adaptive modulation. Consequently,</p>

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	<p>these unused subcarriers (as a result of adaptive modulation) within the allocated time slot or frequency band of a user are wasted and are not used by other users. However, the subcarriers which appear in deep fade to one user may not be in deep fade for other users. In fact, it is quite unlikely that a subcarrier will be in deep fade for all users, as the fading parameters for different users are mutually independent. This motivates us to consider an adaptive multiuser subcarrier allocation scheme where the subcarriers are assigned to the users based on instantaneous channel information. This approach will allow all the subcarriers to be used more effectively because a subcarrier will be left unused only if it appears to be in deep fade to all users.</p> <p>We consider a multiuser subcarrier, bit, and power allocation scheme where all users transmit in all the time slots. Our objective is to minimize the overall transmit power by allocating the subcarriers to the users and by determining the number of bits and the power level transmitted on each subcarrier based on the instantaneous fading characteristics of <i>all</i> users.”)</p> <p>Wong at 1747-1748 (“Once the subcarrier allocation is determined, the bit and power allocation algorithm can be applied to each user on its allocated subcarriers.”)</p> <p>Wong at 1748 (“the <u>downlink transmission in a time division duplex</u> (TDD) wireless communication system to improve the downlink capacity. In such a system, the <u>base station</u> (BS) can <u>estimate the instantaneous channel characteristics</u> of all the BS-to- mobile links <u>based on the received uplink transmissions</u>”).</p> <p>Wong at 1748(“The configuration of our <u>multiuser adaptive OFDM system</u> is shown in Fig. 1. We assume that the system has K users and the k^{th} user has a data rate equal to R_k bit per OFDM symbol. <u>In the transmitter</u>, the serial data from the K users are fed into the subcarrier and bit allocation block which <u>allocates bits from different users to different subcarriers</u>” and Wong assumes that “the <u>instantaneous channel gains on all the subcarriers of all the users are known to the transmitter</u>”).</p>

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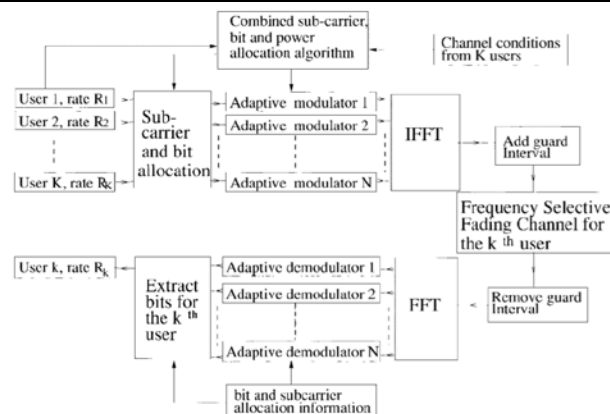


Fig. 1. Block diagram of a multiuser OFDM system with subcarrier, bit, and power allocation.

Wong at 1748 “Using the channel information, the transmitter applies the combined subcarrier, bit, and power allocation algorithm to assign different sub-carriers to different users and the number of bits/OFDM symbol to be transmitted on each subcarrier. Depending on the number of bits assigned to a subcarrier, the adaptive modulator will use a corresponding modulation scheme, and the transmit power level will be adjusted according to the combined subcarrier, bit, and power allocation algorithm.”

Wong at 1748 (“ $c_{k,n}$ ” is “the number of bits of the k^{th} user that are assigned to the n^{th} subcarrier”, “ $\alpha_{k,n}$ ” is “the magnitude of the channel gain (assuming coherent reception) of the n^{th} subcarrier as seen by the k^{th} user”, and “ $f_k(c)$ ” is “the required received power (in energy per symbol) in a subcarrier for reliable reception of c information bits/symbol when the channel gain is equal to unity”);

Accordingly, in view of the above, Wong teaches that “the transmit power, allocated to the n^{th} subcarrier by the k^{th} user must equal”:

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	$P_{k,n} = \frac{f_k(c_{k,n})}{\alpha_{k,n}^2}. \quad (1)$ <p>And thus, since at least “$\alpha_{k,n}$” varies significantly across all of the users and subcarriers, and “$f_k(c_{k,n})$” varies independent of “$\alpha_{k,n}$”, then “$P_{k,n}$” must also vary across all of the users and subcarriers, thereby “<i>modifying a forward path data signal that is to be transmitted to the receiving device based on said at least one forward path pre-equalization parameter, where said modifying includes selectively setting different transmission power levels for at least two Orthogonal Frequency Division Multiplexing (OFDM) tones in said forward path data signal</i>”. Wong at 1749.</p> <p>See Wong at 1750-51 (algorithms / approaches for adjusting the power on the subcarriers to achieve various goals);</p> <p>See 1752-01754 (and Figures 2, 3, 4, 5) (comparing the proposed solution of adapting power levels on OFDM subcarriers using the channel gain with approaches that are independent of the channel gain)</p> <p>See Figure 8, 1756 (algorithm for multiuser subcarrier power allocation);</p> <p>See 1757 (“Given the instantaneous channel information, the algorithm obtains a suboptimal subcarrier allocation, and then single-user bit allocation is applied on the allocated subcarriers. Using this scheme, the overall required transmit power can be reduced by about 5–10 dB from the conventional OFDM without adaptive modulation. Likewise, the transmit power can be reduced by about 3–5 dB from the conventional OFDM with adaptive modulation and adaptive bit allocation, but without adaptive subcarrier allocation. The reduction in transmit power can also be translated to a significant reduction in the required bit SNR for a given BER.</p>

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	<p>Moreover, the same improvement can also be translated to a reduction in the outage probability or to an increase in the area of coverage.”)</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants’ Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>1[a] identifying at least one multipath transmission delay within a reverse path data signal received from a receiving device;</p>	<p>Wong discloses identifying at least one multipath transmission delay within a reverse path data signal received from a receiving device.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussion for 1[p]</p> <p>Wong describes using the channel estimation to adjust the OFDM subcarrier power levels.</p> <p>Wong at 1748 (“the <u>downlink transmission in a time division duplex</u> (TDD) wireless communication system to improve the downlink capacity. In such a system, the <u>base station</u> (BS) can <u>estimate the instantaneous channel characteristics</u> of all the BS-to- mobile links <u>based on the received uplink transmissions</u>”).</p>

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	<p>Wong at 1747 (“One of the main requirements on the modulation technique is the ability to combat intersymbol interference (ISI), a major problem in wideband transmission over multipath fading channels. There are many methods proposed to combat the ISI, e.g., [1]–[3]. Multicarrier modulation techniques, including orthogonal frequency division multiplex (OFDM), (e.g., [4]) are among the more promising solutions to this problem”);</p> <p>Wong at 1752 (“To evaluate the performance of our scheme, we have simulated 1000 sets of five-path frequency selective Rayleigh fading channels with an exponential power delay profile. Each set of channels consists of independent channels, one for each user....”)</p> <p>Wong at 1755 (“A typical scenario is shown in Fig. 6, where the triangles represent the five users. In addition to frequency selective fading, path loss and log-normal shadowing are also included in simulating the actual channel gains seen by the users. Using these channel gains, subcarriers and bits assigned to each user are determined by the various multiple access schemes and the total required transmit power is calculated.”);</p> <p>Wong at 1756 (“In this example, the maximum transmit power is set to the transmit power required for all five users assuming that they are all located at the boundary of the cell, taking into account the path loss effect and a 17 dB fading margin for shadowing.”);</p> <p>Wong at 1748 (“In the frequency selective fading channel, different subcarriers will experience different channel gains. We denote by the magnitude of the channel gain (assuming coherent reception) of the tth subcarrier as seen by the kth user.”)</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as</p>

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	<p>a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>1[b] determining at least one forward path pre-equalization parameter based on said at least one transmission delay; and</p>	<p>Wong discloses determining at least one forward path pre-equalization parameter based on said at least one transmission delay.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel</p>

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	<p>Estimation references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>1[c] modifying a forward path data signal that is to be transmitted to the receiving device based on said at least one forward path pre-equalization parameter, where said modifying includes selectively setting different transmission power levels for at least two Orthogonal Frequency Division Multiplexing (OFDM) tones in said forward path data signal.</p>	<p>Wong discloses modifying a forward path data signal that is to be transmitted to the receiving device based on said at least one forward path pre-equalization parameter, where said modifying includes selectively setting different transmission power levels for at least two Orthogonal Frequency Division Multiplexing (OFDM) tones in said forward path data signal.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>2. The method as recited in claim 1, further comprising: receiving said reverse path data</p>	<p>Wong discloses receiving said reverse path data signal over at least one reverse transmission path.</p>

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<p>signal over at least one reverse transmission path.</p>	<p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches receiving signals at the base station that adjusts the power levels on OFDM subcarriers.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>3. The method as recited in claim 2, further comprising: transmitting said modified forward path data signal over at least one forward transmission path.</p>	<p>Wong discloses transmitting said modified forward path data signal over at least one forward transmission path.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users.</p>

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	<p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>4. The method as recited in claim 1, wherein said reverse path data signal includes at least one type of data selected from a group of different types of data comprising Orthogonal Frequency Division Multiplexing (OFDM) data and Quadrature Phase Shift Keying (QPSK) data.</p>	<p>Wong discloses wherein said reverse path data signal includes at least one type of data selected from a group of different types of data comprising Orthogonal Frequency Division Multiplexing (OFDM) data and Quadrature Phase Shift Keying (QPSK) data.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users. At a minimum, it is obvious that the reserve data signal also uses OFDM.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as</p>

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	<p>a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and QPSK Usage references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>5. The method as recited in claim 1, wherein said modified forward path data signal includes at least one type of data selected from a group of different types of data comprising Orthogonal Frequency Division Multiplexing (OFDM) data and Quadrature Phase Shift Keying (QPSK) data.</p>	<p>Wong discloses The method as recited in claim 1, wherein said modified forward path data signal includes at least one type of data selected from a group of different types of data comprising Orthogonal Frequency Division Multiplexing (OFDM) data and Quadrature Phase Shift Keying (QPSK) data.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been</p>

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	<p>obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the OFDM Tone Modification and QPSK Usage references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>6. The method as recited in claim 5, wherein said modified forward path data signal includes sub-carrier pre-equalized OFDM data.</p>	<p>Wong discloses wherein said modified forward path data signal includes sub-carrier pre-equalized OFDM data.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>

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<p>7. The method as recited in claim 6, further comprising: generating corresponding Quadrature Phase Shift Keying (QPSK) modulation values based on said sub-carrier pre-equalized OFDM data.</p>	<p>Wong discloses generating corresponding Quadrature Phase Shift Keying (QPSK) modulation values based on said sub-carrier pre-equalized OFDM data.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>9. The method as recited in claim 1, wherein said reverse path data signal includes identifiable training data.</p>	<p>Wong discloses The method as recited in claim 1, wherein said reverse path data signal includes identifiable training data.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then</p>

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	<p>adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and Training Data references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>10. The method as recited in claim 9, further comprising: comparing said identifiable training data to a local version of said training data to identify said at least one multipath transmission delay within said reverse path data signal.</p>	<p>Wong discloses comparing said identifiable training data to a local version of said training data to identify said at least one multipath transmission delay within said reverse path data signal.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged</p>

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	<p>invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and Training Data references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>12. The method as recited in claim 3, wherein said at least one reverse transmission path is substantially reciprocal to said at least one forward transmission path.</p>	<p>Wong discloses wherein said at least one reverse transmission path is substantially reciprocal to said at least one forward transmission path.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussion of 1[p], 1[a], 1[b] describing that the base station is a transmitting device (e.g., for the downlink OFDM symbols) and that it also determines the pre-equalization parameter and performs the modification of the forward path (downlink) data signal based on the reverse link.</p> <p>The possible use of the reverse link channel conditions in Wong to adapt the forward path transmissions discloses this claim.</p> <p>Wong discloses TDD and using reverse path channel response to predict forward path channel response, which a POSITA would understand to necessarily disclose the limitations of this claim element. E.g., Wong at 1748 ("The results of the work can be applied, for instance, to the downlink transmission in a time division duplex (TDD) wireless communication system to improve the downlink capacity. In such a system, the base station (BS) can estimate the instantaneous channel characteristics of</p>

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	<p>all the BS-to-mobile links based on the received uplink transmissions. The multiuser subcarrier, bit, and power allocation can then be used.”).</p> <p>Indeed, the ‘369 acknowledges that reciprocity was already well-known prior to the ‘369 patent, particularly for TDD channels. See ‘369 patent at 7:22-34 (“<u>As is well known</u>, many materials are electromagnetically isotropic, which is a property resulting from symmetry in their associated permittivity and permeability tensors. The Lorentz Reciprocity Theorem applies to such materials. Refraction and dielectric reflection from materials therefore often show reciprocity, or equivalence of forward and reverse channel characteristics. Diffraction and reflection are inherently reciprocal due to the minimal media affecting the electromagnetic wave. Thus, reciprocity can be used to determine channel characteristics that are used while pre-equalizing a transmitted path. The use of a reciprocal channel is very useful, for example, when Time Division Duplex (TDD) channels are implemented.”).</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants’ Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
13. The method as recited in claim 1, wherein identifying said at least one multipath transmission delay, determining	Wong discloses wherein identifying said at least one multipath transmission delay, determining said at least one forward path pre-equalization parameter, and modifying said forward path data signal are performed by a transmitting device.

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<p>said at least one forward path pre-equalization parameter, and modifying said forward path data signal are performed by a transmitting device.</p>	<p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and OFDM Tone References references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>14. The method as recited in claim 13, wherein said transmitting device includes a base station device that is operatively configured for use in a wireless communication system.</p>	<p>Wong discloses wherein said transmitting device includes a base station device that is operatively configured for use in a wireless communication system.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p>

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	<p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>15. The method as recited in claim 13, further comprising: using at least one transmitting device receive antenna operatively coupled to said transmitting device to receive said reverse path data signal over at least one reverse transmission path from the receiving device.</p>	<p>Wong discloses using at least one transmitting device receive antenna operatively coupled to said transmitting device to receive said reverse path data signal over at least one reverse transmission path from the receiving device.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving</p>

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	<p>users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>19. The method as recited in claim 15, wherein said transmitting device is operatively coupled to a plurality of first device receive antennas.</p>	<p>Wong discloses wherein said transmitting device is operatively coupled to a plurality of first device receive antennas.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p>

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	<p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>21. The method as recited in claim 15, wherein determining said at least one forward path pre-equalization parameter based on said at least one transmission delay further includes: determining at least one angle of arrival of said reverse path data signal with respect to said at least one transmitting device receive antenna.</p>	<p>Wong discloses wherein determining said at least one forward path pre-equalization parameter based on said at least one transmission delay further includes: determining at least one angle of arrival of said reverse path data signal with respect to said at least one transmitting device receive antenna.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p>

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	<p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>28. The method as recited in claim 13, further comprising: using at least one transmitting device transmit antenna operatively coupled to said transmitting device to transmit said modified forward path data signal over at least one forward transmission path to the receiving device.</p>	<p>Wong discloses using at least one transmitting device transmit antenna operatively coupled to said transmitting device to transmit said modified forward path data signal over at least one forward transmission path to the receiving device.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged</p>

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	<p>invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>32. The method as recited in claim 28, further comprising: setting at least one antenna pointing parameter associated with said at least one transmitting device transmit antenna based on said at least one forward path pre-equalization parameter.</p>	<p>Wong discloses setting at least one antenna pointing parameter associated with said at least one transmitting device transmit antenna based on said at least one forward path pre-equalization parameter.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See claims 15, 28.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>

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<p>33. The method as recited in claim 28, further comprising: setting at least one phased array antenna transmission directing parameter associated with said at least one transmitting device transmit antenna based on said at least one forward path pre-equalization parameter.</p>	<p>Wong discloses setting at least one phased array antenna transmission directing parameter associated with said at least one transmitting device transmit antenna based on said at least one forward path pre-equalization parameter.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See claims 15, 28.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>35. The method as recited in claim 28, further comprising: selecting said at least one transmitting device transmit antenna from a plurality of transmitting device transmit antennas that are each operatively coupled to said transmitting device.</p>	<p>Wong discloses selecting said at least one transmitting device transmit antenna from a plurality of transmitting device transmit antennas that are each operatively coupled to said transmitting device.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p>

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	<p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>36. The method as recited in claim 35, further comprising: selectively transmitting a plurality of beams using two or more transmitting device transmit antennas.</p>	<p>Wong discloses selectively transmitting a plurality of beams using two or more transmitting device transmit antennas.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See claims 15, 28, 35.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as</p>

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	<p>a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>37. The method as recited in claim 36, wherein each of said transmitted plurality of beams is selectively adjusted in phase and amplitude to reduce multipath affects when received by said receiving device.</p>	<p>Wong discloses wherein each of said transmitted plurality of beams is selectively adjusted in phase and amplitude to reduce multipath affects when received by said receiving device.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See claims 15, 36.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Antenna Arrays</p>

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	<p>references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>
<p>41. The method as recited in claim 1, wherein determining said at least one forward path pre-equalization parameter based on said at least one transmission delay further includes: sub-band equalizing said forward path data signal using corresponding frequency domain reverse path data.</p>	<p>Wong discloses wherein determining said at least one forward path pre-equalization parameter based on said at least one transmission delay further includes: sub-band equalizing said forward path data signal using corresponding frequency domain reverse path data.</p> <p>For example, see the following passages and/or figures, as well as all related disclosures:</p> <p>See discussions and citations in 1[p] explaining how Wong teaches determination of the forward path pre-equalization parameter based on the channel estimate and then adjusts the power levels of different OFDM tones for signals transmitted to receiving users using pre-equalized OFDM data. As noted on 1748, Wong teaches a base station can perform the estimate and resulting allocation of power for OFDM subcarriers. A base station is a transmitting device that would have one or more transmit and receive antennas based upon Wong's disclosure.</p> <p>One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention. To the extent this reference is not found to teach this element explicitly, implicitly, or inherently, the element would have been obvious to one of ordinary skill in the art based on this reference, common sense, ordinary creativity of one of ordinary skill in the art, and the state of the art. Additionally, it would have been obvious to combine this reference with one or more other prior art references identified in Defendants' Invalidity Contentions Cover Pleading, particularly, the passages in the base invalidity contention document discussing the Channel Estimation and OFDM Tone Modification references. Rather than repeat those disclosures here, they are incorporated by reference into this chart.</p>

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